

FCC SAR Evaluation Report

Report No. : SA140610C24

Applicant : HEWLETT-PACKARD COMPANY

Address : 3000 HANOVER STREET, PALO ALTO, CALIFORNIA 94304, USA

Product : Laptop

FCC ID : B94-HWME936

Brand : hp; Hewlett-Packard

Model No. : TPN-Q151

Standards : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2003
IEEE 1528a-2005 / KDB 865664 D01 v01r03 / KDB 447498 D01 v05r02
KDB 616217 D04 v01r01 / KDB 941225 D01 v02 / KDB 941225 D02 v02r02
KDB 941225 D03 v01 / KDB 941225 D05 v02r03

Sample Received Date : Jun. 10, 2014

Date of Evaluation : Jun. 17, 2014

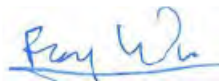
CERTIFICATION: The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch - Taiwan HwaYa Lab**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

Prepared By :



Evonne Liu / Specialist

Approved By :



Roy Wu / Manager



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.



Table of Contents

Release Control Record	3
1. Summary of Maximum SAR Value	4
2. Description of Equipment Under Test	5
3. SAR Measurement Evaluation	6
3.1 EUT Testing Position	6
3.2 Maximum Output Power	7
3.2.1 Maximum Conducted Power	7
3.3 SAR Testing Results	8
3.3.1 SAR Results for Body	8
3.3.2 Simultaneous Multi-band Transmission Evaluation	8
4. Information on the Testing Laboratories	12

Appendix A. Photographs of EUT and Setup



Release Control Record

Report No.	Reason for Change	Date Issued
SA140610C24	Initial release	Jul. 17, 2014

1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported Body SAR _{1g} (W/kg)
PCB	GSM850	0.00
	GSM1900	0.00
	WCDMA II	0.00
	WCDMA IV	0.00
	WCDMA V	0.00
	LTE 2	0.00
	LTE 4	0.00
	LTE 5	0.00
	LTE 7	0.00
	LTE 13	0.00
	LTE 17	0.00
Highest Simultaneous Transmission SAR		Body (W/kg)
PCB+DTS		1.14
PCB+NII		1.16
PCB+DSS		0.66

Note:

- The SAR limit (**Head & Body: SAR_{1g} 1.6 W/kg**) for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991.

2. Description of Equipment Under Test

EUT Type	Laptop
FCC ID	B94-HWME936
Brand Name	hp; Hewlett-Packard
Model Name	TPN-Q151
Tx Frequency Bands (Unit: MHz)	GSM850 : 824.2 ~ 848.8 GSM1900 : 1850.2 ~ 1909.8 WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band IV : 1712.4 ~ 1752.6 WCDMA Band V : 826.4 ~ 846.6 LTE Band 2 : 1851.5 ~ 1908.5 (3M), 1852.5 ~ 1907.5 (5M), 1855 ~ 1905 (10M) LTE Band 4 : 1712.5 ~ 1752.5 (5M), 1715 ~ 1750 (10M), 1720 ~ 1745 (20M) LTE Band 5 : 824.7 ~ 848.3 (1.4M), 825.5 ~ 847.5 (3M), 826.5 ~ 846.5 (5M), 829 ~ 844 (10M) LTE Band 7 : 2502.5 ~ 2567.5 (5M), 2505 ~ 2565 (10M), 2507.5 ~ 2562.5 (15M), 2510 ~ 2560 (20M) LTE Band 13 : 782 (10M) LTE Band 17 : 706.5 ~ 713.5 (5M), 709 ~ 711 (10M)
Uplink Modulations	GPRS : GMSK EDGE : 8PSK WCDMA : QPSK LTE : QPSK, 16QAM
Maximum Tune-up Conducted Power (Unit: dBm)	GSM850 : 32.5 GSM1900 : 29.5 WCDMA Band II : 23.0 WCDMA Band IV : 23.5 WCDMA Band V : 24.0 LTE Band 2 : 22.4 LTE Band 4 : 22.7 LTE Band 5 : 22.6 LTE Band 7 : 22.6 LTE Band 13 : 22.5 LTE Band 17 : 22.5
Antenna Type	PIFA Antenna
EUT Stage	Identical Prototype

Note:

- The antenna information is listed as below.

Antenna Type	Manufacturer	Parts Number	Antenna Gain
PIFA	WNC	Main Antenna: DQ6R15G2200 (81EAAR15.G22)	1.75
		Aux Antenna: DQ6R15G2200 (81EAAR15.G22)	1.84
	YAGEO	Main Antenna: DQ600898400 / ANTA0HQ08984TLWL2	0.06
		Aux Antenna: DQ600898400 / ANTA0HQ08984TLWL2	-0.21

*The antenna gain was the worst for the final test.

- The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

List of Accessory:

Battery	Brand Name	LG
	Model Name	HSTNN-LB6M
	Power Rating	11.4Vdc, 37mAh
	Type	Li-ion
LTE Module	Brand Name	HUAWEI
	Model Name	ME936

3. SAR Measurement Evaluation

3.1 EUT Testing Position

According to KDB 447498, SAR testing for laptop PC is required for bottom surface. This EUT was tested in the base of EUT directly against the flat phantom.

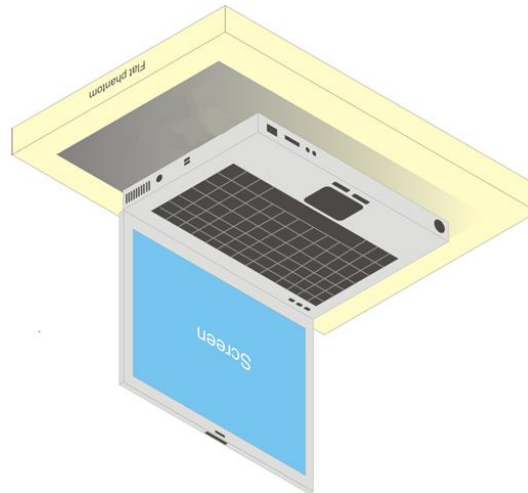


Fig-4.1 Illustration for Laptop Setup

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

1. For the test separation distance ≤ 50 mm

$$\frac{\text{Max. Tune up Power}_{(mW)}}{\text{Min. Test Separation Distance}_{(mm)}} \times \sqrt{f_{(GHz)}} \leq 3.0$$

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2. For the test separation distance > 50 mm, and the frequency at 100 MHz to 1500 MHz

$$\left[(\text{Threshold at 50 mm in Step 1}) + (\text{Test Separation Distance} - 50 \text{ mm}) \times \left(\frac{f_{(MHz)}}{150} \right) \right]_{(mW)}$$

3. For the test separation distance > 50 mm, and the frequency at > 1500 MHz to 6 GHz

$$[(\text{Threshold at 50 mm in Step 1}) + (\text{Test Separation Distance} - 50 \text{ mm}) \times 10]_{(mW)}$$

FCC SAR Evaluation Report

A D T

Mode	Frequency (MHz)	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	Bottom Surface		
				Ant. to Surface (mm)	Exclusion Threshold (mW)	Require SAR Testing?
GSM850	0.848	25.24	334	192.8	970	No
GSM1900	1.909	22.24	167	192.8	1537	No
WCDMA II	1.908	23.0	200	192.8	1537	No
WCDMA IV	1.752	23.5	224	192.8	1541	No
WCDMA V	0.846	24.0	251	192.8	968	No
LTE 2	1.908	22.4	174	192.8	1537	No
LTE 4	1.752	22.7	186	192.8	1541	No
LTE 5	0.848	22.6	182	192.8	970	No
LTE 12	2.567	22.6	182	192.8	1522	No
LTE 13	0.782	22.5	178	192.8	914	No
LTE 17	0.713	22.5	178	192.8	856	No

Note:

Since GSM has multi-slot operation, the maximum tune-up power shown in above table for GSM is source-based time-averaged maximum power.

3.2 Maximum Output Power

3.2.1 Maximum Conducted Power

The maximum conducted power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	GSM850	GSM1900
GPRS 8 (GMSK, 1 Uplink)	32.5	29.5
GPRS 10 (GMSK, 2 Uplink)	30.5	27.5
GPRS 11 (GMSK, 3 Uplink)	29.5	26.5
GPRS 12 (GMSK, 4 Uplink)	28.0	24.5
GPRS 30 (GMSK, 1 Uplink)	32.5	29.5
GPRS 31 (GMSK, 2 Uplink)	30.5	27.5
GPRS 32 (GMSK, 3 Uplink)	29.5	26.5
GPRS 33 (GMSK, 4 Uplink)	28.0	24.5
EDGE 8 (8PSK, 1 Uplink)	27.0	25.5
EDGE 10 (8PSK, 2 Uplink)	25.5	24.0
EDGE 11 (8PSK, 3 Uplink)	24.5	23.0
EDGE 12 (8PSK, 4 Uplink)	22.5	21.0
EDGE 30 (8PSK, 1 Uplink)	27.0	25.5
EDGE 31 (8PSK, 2 Uplink)	25.5	24.0
EDGE 32 (8PSK, 3 Uplink)	24.5	23.0
EDGE 33 (8PSK, 4 Uplink)	22.5	21.0

FCC SAR Evaluation Report

A D T

Mode	WCDMA Band II	WCDMA Band VI	WCDMA Band V
RMC 12.2K	23.0	23.5	24.0

Mode	LTE 2	LTE 4
QPSK / 16QAM	22.4	22.7

Mode	LTE 5	LTE 7
QPSK / 16QAM	22.6	22.6

Mode	LTE 13	LTE 17
QPSK / 16QAM	22.5	22.5

3.3 SAR Testing Results

3.3.1 SAR Results for Body

Standalone SAR for this device is not required.

3.3.2 Simultaneous Multi-band Transmission Evaluation

<Estimated SAR Calculation>

According to KDB 447498 D01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR was estimated according to following formula to result in substantially conservative SAR values of ≤ 0.4 W/kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \frac{\sqrt{f_{(\text{GHz})}}}{7.5}$$

If the minimum test separation distance is < 5 mm, a distance of 5 mm is used for estimated SAR calculation. When the test separation distance is > 50 mm, the 0.4 W/kg is used for SAR-1g.

Mode / Band	Frequency (GHz)	Max. Tune-up Power (dBm)	Test Position	Separation Distance (mm)	Estimated SAR (W/kg)
GSM850	0.848	25.24 (Max Frame-Averaged Power)	Body	0	0.40
GSM1900	1.909	22.24 (Max Frame-Averaged Power)	Body	0	0.40
WCDMA II	1.908	23.0	Body	0	0.40
WCDMA IV	1.752	23.5	Body	0	0.40
WCDMA V	0.846	24.0	Body	0	0.40
LTE 2	1.908	22.4	Body	0	0.40
LTE 4	1.752	22.7	Body	0	0.40
LTE 5	0.848	22.6	Body	0	0.40
LTE 12	2.567	22.6	Body	0	0.40
LTE 13	0.782	22.5	Body	0	0.40
LTE 17	0.713	22.5	Body	0	0.40
BT (DSS)	2.48	8	Body	0	0.26

FCC SAR Evaluation Report

Note:

1. The separation distance is determined from the outer housing of the EUT to the user.
2. When standalone SAR testing is not required, an estimated SAR can be applied to determine simultaneous transmission SAR test exclusion.

<SAR Summation Analysis>

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR_{1g} of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR_{1g} 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR_{1g} is greater than the SAR limit (SAR_{1g} 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
1	GSM850 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
2	GSM850 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
3	GSM850 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
4	GSM1900 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
5	GSM1900 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
6	GSM1900 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
7	WCDMA II + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
8	WCDMA II + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
9	WCDMA II + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
10	WCDMA IV + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
11	WCDMA IV + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
12	WCDMA IV + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required

FCC SAR Evaluation Report

A D T

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
13	WCDMA V + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
14	WCDMA V + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
15	WCDMA V + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
16	LTE 2 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
17	LTE 2 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
18	LTE 2 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
19	LTE 4 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
20	LTE 4 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
21	LTE 4 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
22	LTE 5 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
23	LTE 5 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
24	LTE 5 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
25	LTE 7 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
26	LTE 7 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
27	LTE 7 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required

FCC SAR Evaluation Report

A D T

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
28	LTE 13 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
29	LTE 13 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
30	LTE 13 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required
31	LTE 17 + WLAN (DTS)	Body	Bottom Side	0.40	0.736	1.14	Σ SAR < 1.6, Not required
32	LTE 17 + WLAN (NII)	Body	Bottom Side	0.40	0.757	1.16	Σ SAR < 1.6, Not required
33	LTE 17 + BT (DSS)	Body	Bottom Side	0.40	0.26	0.66	Σ SAR < 1.6, Not required

Note:

1. WLAN SAR is referring to SAR report of 7260NGW (FCC ID: PD97260NG, Report No.: SAR.20130203).

Test Engineer : Enzo Chang

4. Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Taiwan HwaYa EMC/RF/Safety/Telecom Lab:

Add: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Tel: 886-3-318-3232

Fax: 886-3-327-0892

Taiwan Linko EMC/RF Lab:

Add: No. 47, 14th Ling, Chia Pau Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C.

Tel: 886-2-2605-2180

Fax: 886-2-2605-1924

Taiwan HsinChu EMC/RF Lab:

Add: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Vil., Chiung Lin Township, Hsinchu County 307, Taiwan, R.O.C.

Tel: 886-3-593-5343

Fax: 886-3-593-5342

Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

The road map of all our labs can be found in our web site also.

---END---



Appendix A. Photographs of EUT and Setup